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Latest inspection technology for flawless production of fiber composites

100% in-line inspection of composite materials for the highest process reliability and resource efficiency

Composite materials are playing an increasingly important role in various industries. They are often used in safety-relevant areas such as aviation, the automotive industry, or in the construction of wind power plants. There, they lead to time, energy, and costs savings through the weight advantages associated with carbon material. Due to fiber-reinforced plastics' critical safety role in these applications, their inspection is of crucial importance for manufacturers. State-of-the-art tools now enable completely new levels of quality assurance: In addition to the monitoring of raw materials (fabrics, roving) and epoxy resin coatings (pre-pregs), they ensure that the individual rovings/tapes are measured and inspected, while also determining the height of topological material defects in three dimensions. This significantly increases the range of applications and improves production monitoring considerably.

An increasing competitive pressure to ever higher quality standards means that the requirements are becoming ever greater for manufacturers of fiber-reinforced plastics and other composite materials, especially given that most of the products are used in cost-intensive applications with very high safety standards. End customers, such as in the aviation and automotive industries, require their suppliers to have all materials certified, which is why the product

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quality must be fully recorded and documented. Camera-based, all-in-one inspection solutions ensure that composite materials such as glass fibre reinforced plastic GFK, carbon fibre reinforced plastic CFK, Aramid, etc. are reliably inspected at high resolutions. The new inspection systems can be deployed and integrated in a targeted manner, even in highly specialized manufacturing processes, while covering all customer-specific requirements.

Complete inspection and quality documentation in roving/tape production

During the manufacturing of rovings/tapes, where a large number of windings are produced right next to each other simultaneously, the inspection system monitors the individual rovings/tapes with extremely high accuracy. All relevant defects are detected and classified in real time. This enables the machine operator to take corrective action and eliminate defects immediately, thus significantly increasing the share of marketable product. During the production process, the system is able to measure and evaluate each roving's/tape's width, as well as detect split or protruding threads. The system creates a defects log for each individual spool, ensuring 100% inspection and a complete quality documentation, which can be used for internal and external process optimizations and audits. Comprehensive tools for statistical evaluations enable additional conclusions to be made regarding the manufacturing process, helping in optimizing the process parameters of production lines – saving time, costs and resources.

3D height measurement and synthetic resin inspection for flawless production

One of the new and unique methods for surface inspection of fiber-reinforced plastics and composite materials is the 3D height

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measurement of loosely attached fibers, defects and foreign particles in web materials through topological expression. The defect height serves as an important criterion for the exact classification of material defects. Damaged areas are fully measured in three dimensions via the 3D sensor (z sensor) to ensure that height-relevant defects can be precisely distinguished from other defects, such as holes, weaving defects, or contamination. This is particularly important for detecting “fuzz balls” (fiber bundles) located on the material surface. Another significant feature is the inspection of synthetic resin on pre-preg (pre-impregnated) materials. During the inspection of synthetic resins, cameras are used to inspect the uniformity and completeness of epoxy resin coatings on the material. By doing so, the system also inspects the functional properties of the material.

100% in-line inspection for all process stages

ISRA's carbon surface inspection solutions can also be combined with external sensors. Thus, basis weight measurement systems can be integrated just as easily as metal detectors, which identify unwanted metal particles reliably. The latest inspection technology has also been upgraded with several beyond inspection tools. For example, offline recipe optimization now makes it possible to improve the inspection recipe based on recorded video, independent of ongoing operations. This allows for worldwide compliance of the highest quality standards with lowest reject rates, particularly for production on different lines and for frequently changing production orders and quality settings.

With these new features, the inspection systems will become an indispensable tool for achieving the highest level of production efficiency and transparency, ensuring top quality for end customers. The highly sophisticated ISRA imaging analysis algorithms provide

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users with comprehensive evaluation options in real time. This is made possible by the state-of-the-art embedded camera and lighting systems, which detect even the smallest and lowest-contrast defects in all process stages.

Efficient use of resources thanks to customized data reports

All data, such as the classification of defects, is archived for evaluation and subsequent analyses, including images of the defects. Customized reports support users in avoiding future defects, reducing reject rates, and minimizing costs – a decisive factor in the efficient use of resources. In addition to data analysis, the system is equipped with an interface for ISRA's production analytics software ^EPROMI (Enterprise PROduction Management Intelligence). Thanks to the vertical and horizontal data integration, ^EPROMI enables the gathered data from various lines or even different plants to be displayed and analyzed across the company in a comparable fashion. From this, important company decisions can be derived at top-level management level. More than 100 reference installations demonstrate the high level of customer satisfaction, which is based on the highest product quality.

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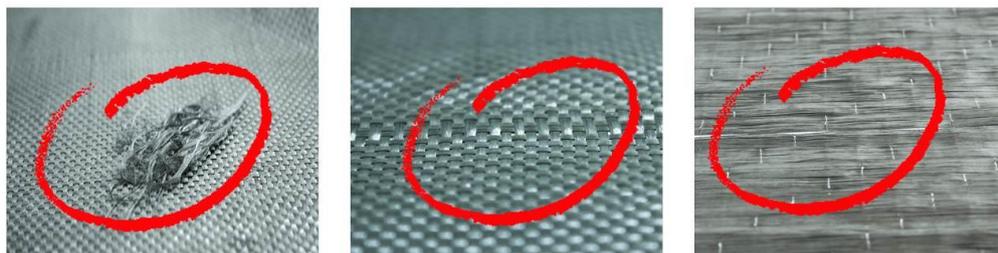
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Images



753_1:

For the highest production efficiency: Reliable detection of loosely attached fibers (fuzz balls) in fiber-reinforced plastics and additional 3D height measurement in topological expression.



753_2: ISRA's high-performance cameras for 100% inspection and monitoring of epoxy resin coatings.

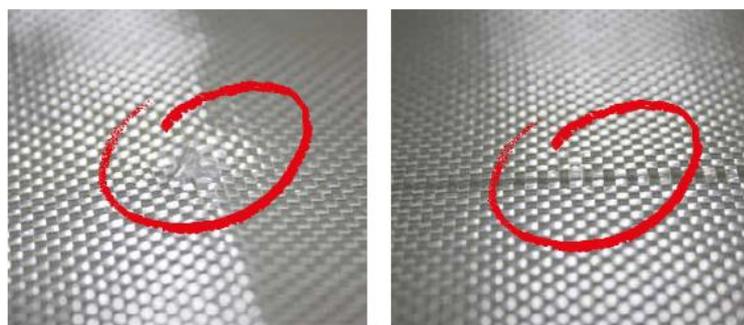
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753_3: Typical defects on fiber composites are detected, classified and visualized for the user in real time.

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